



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
PATENT DIVISION

**RESPONSE/AMENDMENT**

Applicant: Bruce A. Jennings ) April 11, 2004  
Appl. No.: 09/848,789 ) Attorney Docket No. RAR358.01  
Filing Date: 05/04/2001 ) Group Art Unit 2834  
Title: Annular Electro-Mechanical Battery ) Examiner: Tamai, Karl I.

HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS  
Alexandria, VA 22313-1450

**RULE 132 DECLARATION**

I, Bruce A. Jennings, do hereby declare that:

1. I am the inventor for the above-identified patent application and I reside at 14163 French Prairie Road, Woodburn, Oregon 97071.

2. I have 22 years experience in industrial engineering and fabrication, and have been instrumental in the design, construction, and installation of over \$10 million worth of industrial equipment in the roles of employee, subcontractor and manufacturer. I am the sole owner of Velocitech, an engineering and fabrication firm which I founded in 1997. Velocitech is presently producing and developing a variety of industrial machinery and recreational products. Two high-performance three-wheeled street vehicles have been designed and constructed, and a composite ski bike is being researched.

3. I have closely followed the development of composite flywheel energy storage for more than a decade. My designs, parts of which are disclosed in the present patent application, have gained the interest of flywheel development programs in several federal agencies. In the past several years, I have been invited to, and attended, meetings with the heads of flywheel research for the United States

1 Air Force, NASA, and the United States Department of Energy. I have also recently met personally  
2 with the head of Energy Storage for the United States Department of Energy, and was asked to submit  
3 for his examination a detailed report discussing the structure and levitation elements currently under  
4 development

5 4. During the development of my composite flywheel energy storage devices, I have met  
6 with many engineers and other technical professionals, attended technical meetings and conferences  
7 and reviewed numerous industry and technology publications. As a result of my experience, I believe  
8 I have acquired quite an appreciation of the technology associated with composite flywheel energy  
9 storage devices, including electro-mechanical batteries.

10 5. I have reviewed the Examiner's Office Action dated October 10, 2003 with regard to  
11 the present patent application (Patent Application No. 09/848,789) and the patents cited therein,  
12 particularly the Triplett patent (U.S. Patent No. 4,870,310 ), U.S. Patent No. 6,111,332 to Post and  
13 the Japanese patents to Hagiwara (JP 56-063,117) and Murakami, et al. (JP 59-373,323), in sufficient  
14 detail to understand these references. It is my understanding that the Examiner has rejected claims 1,  
15 2, 9-11, 12, 16-18 and 24-26 of the present patent application based on obviousness under 35 U.S.C.  
16 § 103(a). With regard to claim 12, pertaining to the substantially teardrop-shaped cross-section for  
17 the composite rotor, the Examiner stated that "Triplett teaches a teardrop composite rotor 29  
18 supported by magnetic bearings ...." (Office Action, page 3, paragraph 6)

19 6. I maintain that the teardrop cross-section, combined with the surface reinforcement  
20 filaments of the rotor design, disclosed in my patent application not only provides advantages over  
21 prior art, but also is unique and neither revealed in, nor anticipated or made obvious by, existing  
22 patents, including the Triplett patent and the other patent references cited by the Examiner.

23 7. My rotor design utilizes a novel and advantageous structural reinforcement composed  
24 of high-strength filaments spiral-wound over the surface of the hoop-wound filament composite rotor.  
25 The strength and rigidity afforded by this surface reinforcement is intrinsically dependent on the  
26 underlying teardrop shape, for several reasons. First, as seen in natural systems, the teardrop shape  
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1 represents the dynamic state of equilibrium when a fluid is subjected to a continuous, unidirectional  
2 force. In this case, the "fluid" consists of the highly viscous composite rotor subjected to extreme  
3 centrifugal forces. The surface reinforcement filaments represent the surface tension, enclosing the  
4 "fluid's" volume in a dynamically balanced shape. Second, the convex external curvature of the  
5 teardrop shape provides a state of positive tension throughout the surface reinforcement filaments.  
6 This tension is required to resist the centrifugal forces exerted on the mass of the rotor during  
7 operation. Third, as the surface reinforcement filaments follow a spiral wound pattern over the  
8 surface of the rotor, the teardrop curvature eliminates dramatic transitions which would be present in  
9 other cross-sectional shapes (i.e. rectangles, trapezoids, etc.). Such transitions, if present, would  
10 create stress points along the surface filaments, in turn leading to possible structural failure of these  
11 filaments while under load.

12 8. In contrast to the present invention, the Triplett patent, cited by the examiner as  
13 teaching the use of a teardrop composite rotor, clearly presents an isosceles trapezoid for a rotor  
14 cross-section. No where does the patent text or drawings of the Triplett patent allude to the possible  
15 or foreseeable use of a teardrop shape, nor would there be any obvious advantage for that rotor design  
16 to utilize a teardrop shape in order to achieve the novel features disclosed in the Triplett patent. In  
17 fact, little if any benefit would be afforded Triplett's rotor design, as well as other rotor designs  
18 (including mine), simply by fabricating the rotor from hoop-wound filaments into a teardrop cross-  
19 sectional shape. As set forth below, the teardrop cross-section of my invention is necessary to the  
20 optimal function of the spiral-wound filaments. Triplett has no external surface winding.

21 9. While Triplett shares a common advantage with my rotor design by placing a greater  
22 percentage of rotor mass along the outer circumference of his rotor for an increase in rotor-mass  
23 efficiency, no additional advantage would be gained simply by rendering the rotor cross-section as a  
24 continuously convex curved surface to form a teardrop cross-section. In fact, the increased  
25 difficulties involved in the fabrication of an exclusively hoop-wound composite rotor of teardrop  
26 cross-section could not be justified without some clear advantage being recognized in the feature, of  
27 which none is claimed, or alluded to, by Triplett or others.

Jennings Decl.

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1           10. In contrast, the structural advantages of my rotor design over prior art are derived  
2 largely by the spiral-wound surface filaments described in the patent. Composite fibers afford their  
3 greatest strength, by far, when placed inplane to applied tension forces. Tension forces applied cross-  
4 plane to the fibers, to a large degree, must rely on the strength of the composite material's binder in  
5 order to resist structural failure. Industry research has shown that hoop-wound composite rotors are  
6 vulnerable to radial delamination (binder failure) while under the extreme centrifugal loads generated  
7 during operation, when composite material that is farther from the center of rotation is subjected to  
8 greater stress levels than subsequent material.

9           11. In order to achieve higher levels of performance from a given rotor mass, my design  
10 efficiently utilizes the inplane strength of fibers by applying support fibers in spiral fashion to the  
11 surface of a hoop-wound composite core, minimizing the tendency of the hoop-wound fibers to  
12 delaminate. These surface fibers are wound in spiral fashion about the hoop-wound core to form an  
13 equilateral triangular pattern, in plan view. This equilateral triangular pattern affords, what I believe  
14 to be, the highest level of strength and rigidity from such a surface structure. This pattern  
15 subsequently establishes the 2:1 inside to outside ratio of the annular rotor, derived from the points at  
16 which the midpoints and ends of the equilateral triangle sides contact the inside and outside diameters  
17 (respectively) of the annular composite rotor. Further, the teardrop cross-section is based upon, and  
18 necessary to, these spiral-wound filaments in order to create the appropriate pre-tension required for  
19 their proper function, and to eliminate the stress points which would be imposed on these spiral-  
20 wound filaments by use of any non-teardrop (i.e. rectangular, trapezoidal, etc.) cross-sectional rotor  
21 shape.

22           12. Based on my experience in the industry and familiarity with the engineering process  
23 applied to that industry, I do not believe that those skilled in the art of this technology would have  
24 considered it obvious to utilize a teardrop cross-section in the device described in the Triplett patent  
25 or to combine the teachings of the Triplett patent with the Post and/or Hagiwara patents to obtain the  
26 teardrop configuration of the present invention. Nothing in any of the patents referenced by the  
27 Examiner suggests, compels or motivates a person to make such a combination. Unless a person

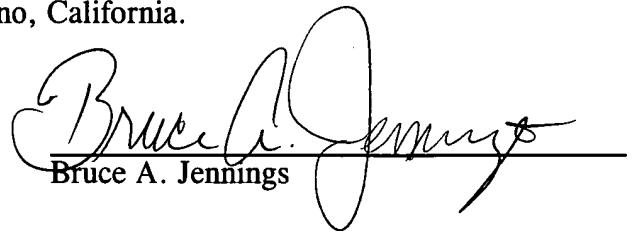
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1 already had determined that it would be beneficial and useful to utilize a teardrop cross-section for a  
2 composite rotor, there is no reason that a person would have combined any of the above patents to  
3 obtain the electro-mechanical battery set forth in my patent application.

4 I further declare that all statements made herein of my own knowledge are true and that  
5 all statements made on information and belief are believed to be true; and that these statements were  
6 made with the knowledge that willful false statements and the like so made are punishable by fine or  
7 imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such  
8 willful false statements may jeopardize the validity of the application or any patents issuing thereon.

9 I declare under penalty of perjury under the laws of the State of California that this  
10 declaration was executed on April 11, 2004, in Fresno, California.

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13 Bruce A. Jennings  
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